small branches of live-oak into one of the mounds described, near the "gates." These were soon withdrawn, and seen to be covered with "cutters" busily occupied. It was thus possible to examine them at work by the light of a lantern, as it will doubtless be remembered that night is the busiest time with these active ants, supplying their minuteness with a most effective shelter.

The "cutter," usually an ant belonging to the caste next below the "soldier" in size, first grasps the leaf with outspread feet, and begins to cut into its edge by a scissors-like action of her sickle-shaped toothed mandibles. Thus she naturally proceeds, with steady motion, until the mandibles have clipped off a portion of the leaf, having a circular edge, clean cut. The feet turn as the head turns. The cutter sometimes drops, with the piece just cut, to the ground; but probably, if possible, retires when the piece has dropped, to continue her professional occupation. Mr. McCook found at the foot of one tree a pile of cut leaves, to which clippings were continually being added, dropped by the cutters. The carrier at the foot took them up and carried them to the nest. The loading of the cuttings is thus accomplished: the piece is seized by the curved mandibles, the head is raised, the piece is thrown back by a quick motion, seeming to be lodged on its edge within the deep furrow that runs along the entire median line of the head with the exception of the clypeus, and supported between prominent spines on the edge of this furrow and on the prothorax.

The young saplings near the mound at Camp Wright were found almost entirely stripped of leaves by these ants. The great tree (live-oak) near by was in parts stripped to the very top. In beginning work on a tree the cutters seem to aim first at the topmost leaves. They prefer trees with a smooth leaf; they eat grapes, radishes, &c., and can take celery, beet, young maize, and wheat, plum leaves, honeysuckle, and jessamine. Strangely enough, they do not like lettuce, paper-mulberry, figs, cedar, except the buds, when very hard up in winter. A nurseryman, on whose grounds Mr. McCook witnessed the ants at work and the scene of their former exploits, told him that they even entered his desk-drawers, and carried away part of his chewing-tobacco. At another plantation Mr. McCook saw an immense column of the ants engaged in plundering a granary of wheat.

One of the most interesting questions for evolutionists centres undoubtedly in the causes and mode of continuance of the castes or differentiated forms of species like this ant. The worker-castes are sterile, and produced from eggs laid at different periods by the female; and as to a blending of castes by intermediate forms, nothing has yet been seen or proved in the case of the cutting-ant, after careful examination by the microscope. The lowest castes of minims, in all individuals Mr. McCook examined, with special reference to the mouth-organs and eyes, had the same structure in equal definiteness and perfection, as the larger castes. Consequently, Mr. McCook again finds no way of comprehending how natural selection could have produced or preserved or improved these castes. May I suggest that we know as yet too little of the whole life-history of social animal communities, to say nothing of their past history in time, their conditions during long series of years, and the reaction of each community on its surroundings, to assert that any hypothesis of evolution admissible as a *vera causa* in one case is inadmissible in another? We are but on the threshold of the study of the influence of social laws and conditions upon human communities; how can we expect to understand the influence of society and common interests upon specialisation in ants? Yet there are even now several possible ways of imagining the influence of variation and changed conditions to have aided in producing castes. May it not be that the comparative study of *ant-communities* of the same species, or of different species of the same genus will at length furnish a key much more valuable than we yet know? How is it that nations of man rise and fall, increase or decrease? Are not all men of one species? Why are there so many castes? If we cannot answer these questions perfectly, why be dismayed if we quarrel about terms as to the intelligence or reason displayed by various animal forms? There is nothing to be done but for men to wait, study to comprehend the nature of proof, and then patiently investigate. The explanation of all difficult problems will, if we are to judge by the history of science, be very simple, much simpler and more illuminating than the acrobatic or the prejudiced intellects would have us believe.

G. T. BETTANY

NOTES

THE exhibition at Croydon, held in connection with the Congress of the Sanitary Institute of Great Britain, has a peculiarity attached to it which, though it has its advantages, is a disadvantage to the visitor. The peculiarity is that the awards of the judges will not be made known till the day of closing, viz., November 8. At most exhibitions visitors have their attention drawn to objects of high merit by the announcements of the honours the judges have awarded; but here, and this, too, on subjects often affecting their own health, visitors can, even if they care to take that trouble, only form their own opinions, guided by the skilled advocacy of the attendants at the different stalls. If all the objects announced in the catalogue as "essential," "indispensable," "infallibly safe," and "the only ones of the kind made," are really so, then the practical application of sanitary science in households is in a lamentably backward state, even in particulars where those who are our leaders in sanitation would least expect it. It can hardly be supposed, however, that all the exhibits shown have been admitted with the sanction of the Council as illustrations of the subjects discussed at the Institute. There are, for example, music stands, clocks, sausage mincers, billiard registers, weighing machines, mechanical toys, flower scissors, electric pens, nickel-plated goods, pantographs, bells, telephones, china cements, "lightning" knife sharpeners, &c. Some of the exhibits are made on principles that have been repeatedly denounced; for example, filters so closed that the filtering medium cannot be easily and frequently changed are now by our most experienced observers admitted to be unsafe, yet there are some in the exhibition. Traps of certain construction have been likewise denounced, yet they are shown. Ventilators of patterns generally regarded as practically useless, and so-called disinfectants which are only deodorisers, are shown. It might, perhaps, have been well had the exhibition been called one of "Sanitary and unsanitary appliances," and then the visitor would have been put on his guard not to believe in everything shown there. Mr. F. P. W. Essie, C.E., has contributed part of a collection of the materials on which his paper on the dangers of bad plumbing (read at the Congress) was based. It is intended as an unsanitary exhibition, and shows in an alarming manner how some so-called sanitary appliances may become a positive source of danger. Each specimen exhibited "has been associated with death and with disaster in some shape or other." It is a pity no handbook or any kind of guide other than the unclassified list of entries in the catalogue has been prepared. We may be able to return to the subject next week when noticing the list of awards.

AN article in the last number of the *Revue Scientifique* contains an interesting account of Mont Ventoux (1,928 metres high), and of the scheme for erecting a meteorological observatory thereon. The project, which has been prepared by M. Morard, under the direction of M. Bouvier, includes, first, the construction of a carriage road, which will render the summit accessible at all times. The total length will be 19 kilometres.

The observatory will be placed at the very summit of the mountain, on a platform of rock. It will consist of a small round tower, constructed to resist the most violent winds. Every means will be taken to establish an equilibrium of temperature between the inside of the tower and the outer air. The dwelling-house will be built a little lower, on the south slope, and thus sheltered from the mistral which is extremely violent on the summit of the mountain, and indeed has given to the mountain its name of *Ventoux*. A covered gallery of 11 metres will connect the house with the tower, access to which will thus be easy, even in the midst of snow and storms. At the instance of Admiral Mouchez rooms will be reserved in this house for scientific men, who may come in summer to carry on researches in astronomical physics, for which the limpidity of a Provençal sky is so favourable. The difficulties of execution would not appear to be very great, and, in comparing the situation of the future observatory with that of the Pic du Midi, General Nansouty has gone so far as to compare the summit of Ventoux to a sort of earthly paradise. The necessary expenses are calculated at 150,000 francs, and to this all the chief towns of the South-East have already contributed handsomely, their municipal councils having the intelligence to perceive the great practical benefit to be derived from such an observatory.

THE project of erecting a meteorological observatory on the top of the Ballon de Gervance, in the department of Haute-Saone, is progressing favourably. A fortress is being built on this elevated site, and will be finished next year. The garrison will very probably have the care of meteorological observations. A telegraphic line has been already established between the intended station and Belfort.

M. BISCHOFSHEIM is leaving for Nice with M. Garnier, the architect of the opera, and M. Lœwy, the sub-director of the Paris Observatory, in order to inspect the site on which he intends to erect the new observatory, on which he is to spend a sum of 60,000*l.*, as we mentioned in our notes some months ago. Before determining on the details of his plan, M. Bischofsheim and his scientific and artistic advisers are to visit the most celebrated observatories of Austria, Germany, and England during this winter.

KING HUMBERT, of Italy has sent a donation of 20*l.* to a committee organised to obtain subscriptions for erecting a statue to Galvani at Bologna. Galvani was born in that city in 1717, where he was a professor in the University; he died in 1798.

THE *Journal Officiel* publishes a decree organising, at the Observatory of Paris, the School of Astronomy of which we announced, a few months ago, the imminent creation. The pupils are to be appointed by the Minister of Public Instruction rom pupils of the Normal or Polytechnic Schools, or graduates in the mathematical sciences. They must be more than twenty-five years of age. They are to receive 6*l.* a month during two years, and reside in the observatory. They will be obliged to follow courses of lectures at the Sorbonne and Collége de France. The Astronomers of the Observatory will give them special instruction. After having passed their examination, they will be appointed *aides-astronomes* in any of the Government observatories, with a salary of 10*l.* monthly. During their stay at the observatory they will practise calculations, meridian, and physical astronomical observations. *Elèves libres* will be admitted under a certificate of efficiency.

MR. C. L. WRAGGE, F.R.G.S., of Cheadle, has presented to the town of Stafford an excellent collection of specimens obtained by him in his travels in various parts of the world, and which will, no doubt, prove of great value to all those interested in geology and natural history.

IN the Cassel State Library, as well as in the Archives at Hanover, Dr. Gerland has succeeded in discovering a whole series of important original letters, hitherto not known, from the pen of Leibnitz, the philosopher, and of Papin, one of the inventors of practical applications of the power of steam.

RUSSIAN papers publish the project of the Exhibition of Manufactures and Fine Arts, which will be opened in 1881 at Moscow. We learn that the Moscow Anthropological Society and the University propose to take an active part in it, and to give to the exhibition a scientific value.

WE learn that in the month of January, 1880, an artistic and scientific exhibition will be opened in Algiers. It will be the first which has been ever held in the colony.

THE Society of Anthropology of Paris has received, at its last meeting, a letter from Felyx-Denys-Rapontayabo, a native King, in the Gaboon, who, having been educated in the Catholic mission, is a tolerably good French scholar. His Negro Majesty is sending to the Anthropological Society the skeleton of a gorilla, and volunteers to send any scientific documents which may be required.

IN his last report from Saigon, Mr. Consul Tremlett alludes to his having been ordered by the Foreign Office to procure and send home a quantity of the bark known as *hwang-nao*, which during the past four or five years has been exported from Tongking to Trinidad, and there seems to have proved efficacious in cases of leprosy. The tree from which it is obtained is hardly known except to the missionaries, and is only found in the mountain forests of the north of Annam.

A VIOLENT shock of earthquake is reported to have occurred in West Cumberland at 5.30 A.M. on Saturday week. A vivid flash of lightning was seen at the same time. The shocks of earthquake in the southern districts of Hungary, some lasting from forty to fifty seconds, continue in a north-easterly direction, and keep the population in a state of alarm. A shock of earthquake in the direction from south-west to north east, was felt at Ekaterinodar, Caucasus, on October 9, at 8h. 55m. P.M.

THE Municipal Council of Paris has decided that artificial cold should be applied to the mortuary, in order to keep corpses in a state fit for public inspection and possible recognition for a longer period. In compliance with that decision a Commission, presided over by M. Vauthier, an engineer of the Ponts-et-Chaussées, who resided long in England, has been appointed to report upon the several ice-manufacturing machines. The work of the Commissioner is by no means an easy one. The pneumatic process is not, so far as we are informed, to be brought into the competition. The ammoniac, the chloride of methyl, and the sulphurous acid processes are then to be brought under consideration. The two last methods are now exhibiting at the Champs Elysées Palace, and the ammoniac process is used in the largest Parisian ice-house, the "Glacière du Bois de Boulogne."

A RETURN by the Director of Administrative Statistics at Vienna (based on the latest census of the great European states) shows that out of 102,831 persons who lived over ninety years, 42,528 were men and 60,303 women. The longevity of women is yet more apparent when we consider the numbers of human beings who attain and live beyond 100 years. In Austria, there were 229 women centenarians to 183 male ditto; in Italy, 241 female to 141 male; in Hungary, 526 female to 524 male, &c.

IN a recent Consular Report on the trade and commerce of Benguzi the sponge fishery is described as being entirely in the hands of Greeks belonging to Kalimnos, Hydra, and other islands, who annually frequent the coast of the Gulf of Sidra during the months of August and September. This branch of industry affords employment to upwards of 200 small vessels. A diving apparatus is used in fishing for sponges; the produce during the season is between 25,000 and 35,000 sponges. A duty of 40*l.* is levied by Government on each diving apparatus and 10*l.* on every vessel not carrying that appliance. The produce of the sponge fishery last year was estimated to be worth about 15,000*l.*, and was exported chiefly to England.

MESSRS. FRANCIS AND CO., of Hatton Garden, have recently devised an extremely useful telegraphic arrangement for ships, by which instant communication is given by the captain or officer of the watch to the helmsman. For the navigation of rivers and small waters such means of rapid telegraphing with the man at the helm must be invaluable, as in an instant an order can be given, and that, too, with absolute certainty. A leading and important feature in this new invention is that the signals to every part of the ship can be given from the one instrument, which is in form like a handsome capstan, with the commutators so arranged horizontally around its head that it may be worked by any one without the least instruction.

A COURSE of elementary lectures in continuation of a description of the solar system will be delivered in the theatre of Gresham College, Basinghall Street, London, E.C., on the evenings of November 11, 12, 13, and 14, by the Rev. E. Ledger, M.A., F.R.A.S., Gresham Professor of Astronomy. The lectures will be delivered at 6 o'clock P.M., and will be free to the public. They will be illustrated by means of a lime light.

As we have announced, the three Parisian telephonic companies have entered into a working arrangement, and are busy settling the details. In consequence of this fusion the subscriptions have ceased to be received, the future common price having not yet been agreed 'upon. It is certain that it will be dearer than the cheapest, and cheaper than the dearest. According to every probability 600 francs a year for a single line.

THE gold discoveries in the north of New Caledonia are reported to be turning out very valuable.

FROM Japan we hear that the manufacture of sulphuric acid is now being extensively carried on at the Osaka Mint, and large quantities are exported to China.

THREE boa-constrictors, found in the Chinese island of Hainan, have lately been presented to the Botanical Gardens at Hong Kong.

WE learn from a report on the trade and navigation of New York for 1878 that grape-sugar is being largely manufactured at Buffalo, three large factories have been established for the manufacture of glucose in a solid and liquid form, 200,000 to 300,000 bushels of corn being used in them per month. This product has a ready sale and is largely exported to Europe and other countries, and the business is said to be a very profitable one.

THE principal papers in the Thirteenth Annual Report of the Aëronautical Society are on the Flight of Birds, by Mr. Brearey and Mr. H. Sutton.

THE report of the meeting of October 17 of the Eastbourne Natural History Society contains a paper "On the Additions to the Fauna and Flora of the Cockmere District during the past year," by Mr. F. C. S. Roper.

THE additions to the Zoological Society's Gardens during the past week include a Weeper Capuchin (*Cebus capucinus*) from South America, presented by Mr. A. Sargent; a Silver Pheasant (*Euplocamus nycthemerus*) from China, presented by Mr. R. Moon; three Common Boas (*Boa constrictor*) from Bahia, presented by Mr. W. Young; a Bosman's Potto (*Perodicticus potto*) from West Africa, four Pied Wagtails (*Motacilla yarrellii*), British, purchased.

OUR ASTRONOMICAL COLUMN

MINOR PLANETS IN 1880.—In the first half of the ensuing year three out of the four older minor planets, viz, *Ceres*, *Pallas*, and *Vesta* will come into opposition while not far from perihelion, and consequently their angular diameters and brightness will be about as great as they ever can be, thus :—

Pallas in opposition on Jan. 12 will be in perihelion on Feb. 23.
Ceres ,, ,, Feb. 12 ,, ,, Feb. 18.
Vesta ,, ,, June 2 ,, ,, June 19.

At opposition the brightness of *Pallas* will be 6·8m., that of *Ceres* 7·3m., and that of *Vesta* 6·0m.

Perhaps advantage may be taken of the favourable conditions attaching to the positions of these planets to ascertain if they do really present measurable disks as has been stated by Lamont in the case of *Pallas*, and by Secchi in that of *Vesta*. Lamont, soon after the mounting of the 11-inch refractor at Munich, on a night of exceptional clearness, found that *Pallas* presented a defined disk, which at the mean distance of the planet from the sun would subtend an angle of 0″·51, which would correspond to 1″·41 at the distance unity. Again, Secchi observing on nights near the opposition of *Vesta* in 1855, noted a disk a little less than is presented by Jupiter's first satellite, or about 0″·8, which at the earth's mean distance from the sun would subtend 1″·01. There is a third instance in the case of one of the more recently discovered planets, *Iris*, which at the close opposition in the winter of 1866, was measured by Mr. Talmage with Mr. J. G. Barclay's 10-inch refractor at Leyton; he found the apparent diameter 0″·96, or the diameter at distance unity 0″·89. Hence we should have for the real diameters 630 miles for *Pallas*, 450 miles for *Vesta*, and 400 miles for *Iris*, dimensions beyond those which have been attributed to them on other grounds. The south declinations of *Pallas* and *Vesta* will render them fitting objects for examination at Melbourne should Mr. Ellery be disposed to try the powers of his great reflector upon them. *Ceres* will be well observable in this hemisphere.

While writing upon minor planets it may be mentioned that their number has now been increased to 207; a circular from Prof. Peters, of Kiel, notifying the discovery of four new ones at Clinton (New York) and at Pola, by Prof. C. H. F. Peters and Herr Palisa.

THE RED SPOT UPON JUPITER.—Dr. O. Lohse, of the Physical Observatory at Potsdam, who has watched this planet regularly during the last nine years, mentions that on June 5, when his observations of the present year commenced, the red spot was of an intensity of colour to be perceived at the first glance at 15h. m.t., when it was near the eastern limb. The sharp outline and the form of the spot appearing to offer an advantageous opportunity for another determination of the time of rotation, numerous estimations and some measures of its position and size have been made at Potsdam. Dr. Lohse does not refer to any suspicion of proper motion, of which we have heard elsewhere, but, on the contrary, states that, with the rotation-period, 9·9221h., added on to the epoch 1879, September 27, at 9h. 48·3m., Berlin M.T. (or 8h. 54·7m. G.M.T.), the successive times of transit of the middle of the spot over the central meridian may be obtained. From sensible variation in the intensity and tint near the centre and limbs of [the planet he conjectures the superposition of very dense gas or vapour. As the spot exhibits remarkable permanence, it may be also observable next year, and thus be the means of fixing the period of rotation with precision. Dr. Lohse further notes that this remarkable appearance upon the disk of Jupiter takes place at the time of recommencement of activity in the solar atmosphere.

A STANDARD CLOCK AT THE OBSERVATORY, STRASSBURG.—Those who give attention to horological matters will note with interest a communication from Prof. Winnecke, Director of the Imperial Observatory at Strassburg, on the performance of a clock constructed for that establishment by Hohwü, of Amsterdam. The observed rates between 1875 and 1878 are exhibited in tabular form, and are compared with rates calculated from a formula which Dr. Schur has investigated, viz. :—

$$\text{Daily rate} = \overset{\text{s.}}{0{\cdot}000} + \overset{\text{s.}}{0{\cdot}0125}\,(b - 750) - \overset{\text{s.}}{0{\cdot}0110}\,(t - 20),$$

where *b* is the height of the barometer in millimetres and *t* the temperature in the clock-case expressed in degrees of Celsius. The tabular statement (*Ast. Nach.*, No. 2,282) is much too long to be reproduced here, but we make the following extract showing the observed and computed rates applying to the two-months'